ONLINE TRAINING PROGRAM ON
TUNNELS & TUNNELLING

Dr DHAWAN ACADEMY of GEOLOGISTS

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Organised by AFA and DDAG and presented by

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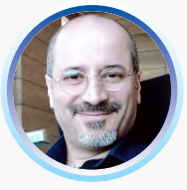

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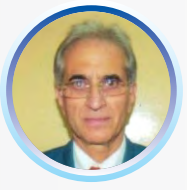

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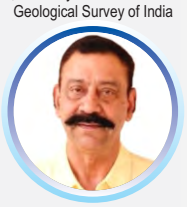

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WAGNER, Dr. Harald
Consulting Engineer
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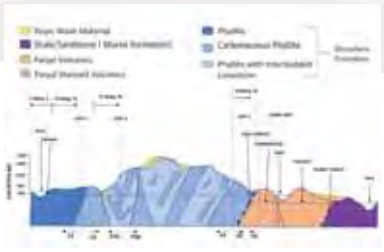
About the Program

Tunnelling is integral to infrastructure development and this online training program aims at imparting an in-depth knowledge pertaining to all aspects of tunnels and tunnelling pertaining to hydro and transport projects at a single platform.

Spanning the entire spectrum from planning to operations & maintenance stages, the program with 100 pre-recorded lectures ensures that each and every aspect like survey & investigation, design, and construction of a tunnel is addressed.



As a unique offering, the program comprises a set of 51 lectures in the Core Segment, addressing aspects of general interest, and allows the participants to choose from the remaining lectures in the Optional Segment depending upon their requirement. With the twice-a-week release of the lectures, interspersed with interactive sessions with the faculty, the training program is designed for a schedule spanning 25-weeks.

Contents

The broad list of topics is given below. It also gives a full glimpse of the program to the participant at the time of program announcement and helps him choose the lectures of his choice.

3.1 Lecture Modules

Course comprising following Modules spanning the full spectrum of a tunnelling project from inception to O&M. These shall be divided in to 2 packages, viz. core and optional

1. Introduction
2. Formulating a project
3. Survey & investigation
4. Design
5. Tender and contract management
6. Tunnel construction

3.2 Lecture Capsules

Lecture Capsules will be released twice a week – Monday (Two lectures) and Thursday (Two lectures).

Core Segment

Module.1: Introduction
- Introduction to Tunnels

Module.2: Formulating a Project
- Preliminary appraisal for tunnels
- Preliminary Geological appraisal for tunnels
- Selection of options for method of execution – TBM, DBM

Module.3: Survey & investigation
- Topographical surveys : development of contour plans
- Development of topographical plans and DTMs using GIS techniques
- Surface geological mapping 1
- Surface geological mapping 2
- Rock Mechanics inputs : Laboratory tests on rocks 1
- Rock Mechanics inputs : Laboratory tests on rocks 2
- Rock Mass Classification: 1
- Rock Mass Classification: 2
- Rock Mass Classification: 3
- Rock Mass Classification: 4
- I - System : Index of Ground - Structure A Comprehensive Classification and characterisation system for ground (rock and soil) - Part 1
- I - System : Index of Ground - Structure A Comprehensive Classification and characterisation system for ground (rock and soil) - Part 2
- Geological logging : drill holes
- Geological logging: Drifts & Shafts
- Hydrogeological studies for tunnels
- Seismic design parameters
- Rock stresses in tunnel design
- Preliminary geological modelling
- Geophysical Surveys 1
- Geophysical Surveys 2
- Directional Core Drilling
- Laboratory tests for soils
- Rock- excavation testing for TBM Tunnels Part -I
- Rock- excavation testing for TBM Tunnels Part -II
- Environment Appraisal for Tunnels
- Geological inputs for DPR & Feasibility Reports
- Experiences with GBR - Risk Sharing in Tunnel Engineering

Module.4: Design
- Layout optimisation, dimensioning and tunnel shape profiling of Highway Tunnels
- Layout optimisation for tunnel alignment and adits of Hydro Tunnels
- Dimensioning and tunnel shape profiling of Hydro Tunnels
- Geotechnical design aspects of Metro Tunnels
- Design Philosophy for rock support
- Rock and rock mass failure criteria :Mohr-coulomb, Hoek-Brown etc

- Wedge Analysis/ Kinematic Analysis
- Stability analysis of tunnels – Unwedge
- Empirical methods to assess squeezing potential of tunnels in rocks
- Empirical Methods of tunnel support design
- FEM for rock support design
- Numerical Tools for rock support design- 1
- Numerical Tools for rock support design- 2
- (I)-TM : An Intelligent Tunnelling Method & underground design approach
- Design Origin and Formulation of Conventional Metro Tunnels and Stations

Module.6: Tunnel Construction

- Equipment planning for DBM tunnels
- Equipment planning for TBM tunnels
- New Austrian Tunnelling Method
- Norwegian Method of tunnelling (NMT)
- DBM tunnels - Blast design – Control of pull in different rock mass classes
- Instrumentation of tunnels

Optional Segment

Module.3: Survey & investigation

- Rock Mechanics inputs : Laboratory tests on rocks 3
- Rock Mechanics Inputs : Shear strength of intact rocks
- Rock Mechanics Inputs : Shear strength of joints
- Rock Mechanics Inputs : Shear strength of rock mass 1
- Rock Mechanics Inputs : Shear strength of rock mass 2
- Advanced exploration techniques (Geophysics)
- Aeromagnetic surveys
- In-situ rock mechanics tests 1
- In-situ rock mechanics tests 2

Module.4: Design

- Stability analysis of tunnel portals – Swedge, RocPlane, RocTopple
- Options for selection of rock support elements : rock bolts, rock anchors, cable anchors, RRS, Lattice girders, precast concrete segments, shotcrete etc.
- Design of tunnel Portals
- Types of lining – Plain, Reinforced concrete lining, Shotcrete lining, Steel lining – Special membranes
- Design of Lining
- Drainage and Waterproofing of Tunnels

Module.5: Tender and Contract Management

- Contract Formulation for Tunnels – 1
- Contract Formulation for Tunnels - 2
- Geological Risk Assessment
- Risk Sharing Machanism - 1
- Risk Sharing Machanism - 2
- Contract Management at Tala hydroelectric project, Bhutan

Module.6: Tunnel Construction

- Tunnel Construction Scheduling
- Overall planning for tunnel construction
- Choice of conventional Tunnelling method : Case Study
- Technological advancements in Rock TBMs : Case Study
- Ventilation & Lighting during construction of Tunnels
- Dewatering during construction of Tunnels
- ViD: Vibration induced Damage assessment for underground structure
- TBM bored tunnels Part-1
- TBM bored tunnels Part-2
- Tero-technological aspects and disc cutter refurbishment
- Necessity & efficacy of pre-grouting
- Installation / placement of Primary support
- Special support elements in weak strata – Forepolling, RRS, Lattice girder, Pipe roofing
- Deformation monitoring and optimization of rock support system
- Control of section and alignment – Use of lasers
- Record keeping and documentation
- Construction of a DBM tunnel: Case Study, Tala Hydroelectric Project, Bhutan
- Placing the lining – Choice of the system- Number & length of gantry
- Practical problems vis-à-vis design assumptions – Kerb and related issue
- Grouting behind concrete linings and treatment of joints in tunnel linings
- Lining in TBM bored tunnels – Related issues and grouting
- As built Geology & support Installation
- Dewatering of tunnels for repair – limitations and practices
- Geophysical Investigations for existing Tunnels
- Monitoring: Surface observations – Measurements by targets; Piezometers and water pressure measurements
- O&M aspects of Hydro Tunnels
- O&M aspects of Highway Tunnels
- O&M aspects of Metro Tunnels
- Maintenance and Repair of Transportation Tunnels

Course Delivery Mechanism & Schedule

The course will be delivered through Learning Management System (LMS) where pre-recorded lectures, videos, presentation, reading material etc. will be uploaded enabling participants go through these at their own pace, within the stipulated time frame.

Starting with Core Segment, the lectures are released two at a time, twice a week (Monday, Thursday), followed by sequential release of Optional Segment lectures. Each lecture will be of 20-25 minute duration.

Interactive sessions with faculty shall be convened every four-week, wherein participants can directly interact with experts and get their concerns resolved. Preferred mode of receiving concerns and queries would remain through email, enabling development of a comprehensive Q&A.

Who Should Attend?

This training program shall benefit professionals, engineers, geotechnical engineers and geo- scientists dealing with tunnelling projects. The program shall be of value to owners of the tunnelling projects while hiring services for planning, investigating, designing, constructing, and operating their projects. The participants of the program will be able to contribute and add value in the accelerated and economic development of tunnelling projects.

Fee Structure

Description	Government	PSU, Boards, Private	Students/ Full time research Scholars
Full Programs (core plus optional)	INR 10,000/ USD 200	INR 17,000/ USD 350	INR 7,000/ USD 140
Core Segment Only	INR 6,000/ USD 120	INR 10,000/ USD 200	INR 4,000/ USD 80
Optional Lecture (Each)	INR 150/ USD 3	INR 250/ USD 5	INR 100/ USD 2

GST will be charged extra as applicable. (present rate of GST is 18%)

Registration Process

Registration can be done online at https://tunnelling.in/. In case of bulk registrations, please contact DDAG/ AF Academy at details provided hereunder. Prior registration is must by sending email to praggya@tunnelling.in. Fee to be deposited in the following account.

Online Bank Transfer Details
Name of the Bank: ICICI Bank Ltd
Address of the Bank: ICICI Bank, 9 A, Phelps Building, Connaught Place, New Delhi - 110001
Name of the Account holder: AQUA FOUNDATION
A/C No.: 000701260885
IFSC Code: ICIC0000007
Swift code: ICICI NBB CTS

Contact Details

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